# Contribution of environment factors to the temperature distribution according to different resolution levels

## Test in a small area of Svalbard

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9th Bi-Annual Circumpolar Remote Sensing Symposium
May 15-19, 2006
Seward, Alaska, USA

# Objectives

Climate is organized hierarchically according to scale levels

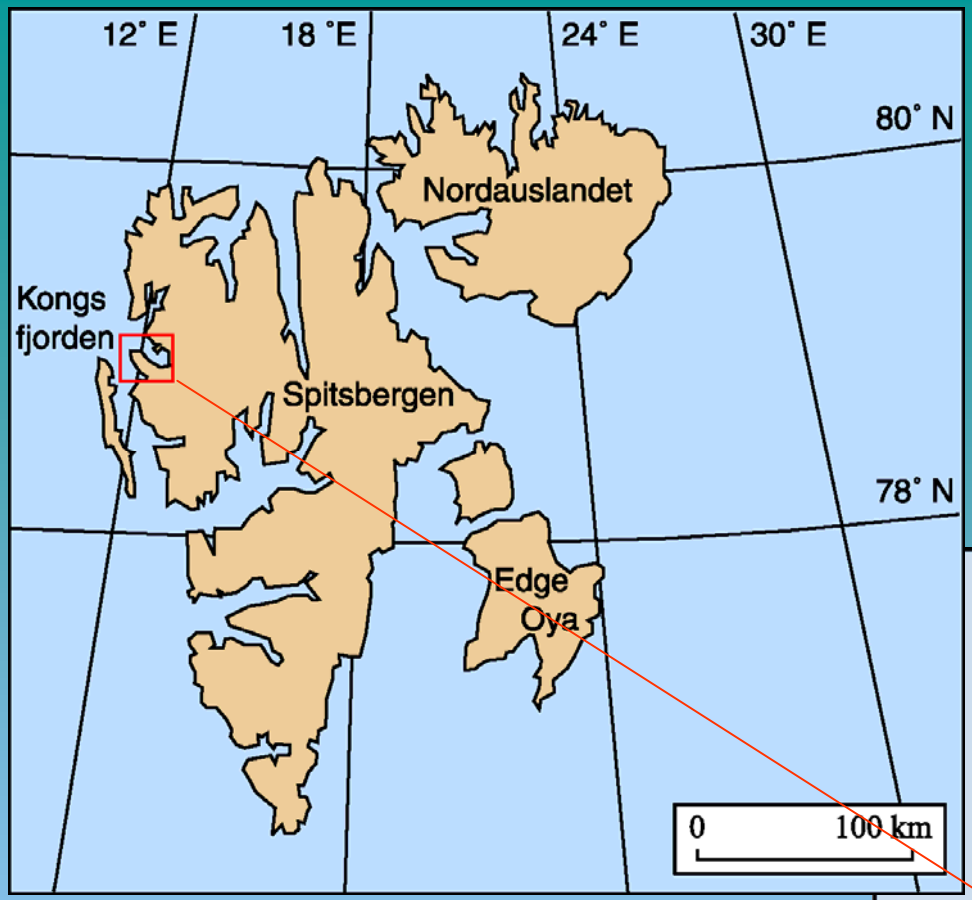
Temperature, one major climate element in the Arctic, depends on scale levels of landscape structures

The objective is to identify the scale level for which the contribution of topography and land cover to temperature spatial variation is the highest

# Organisation of the presentation

- 1. Study area
- 2. Data sets:
  - Temperature measurements
  - Remote sensed data
  - DTM
- 3. Method
- 4. Results

# 1. Study area localisation




Svalbard archipelago


Kongsforden area

# Study area and localisation of the 53 loggers

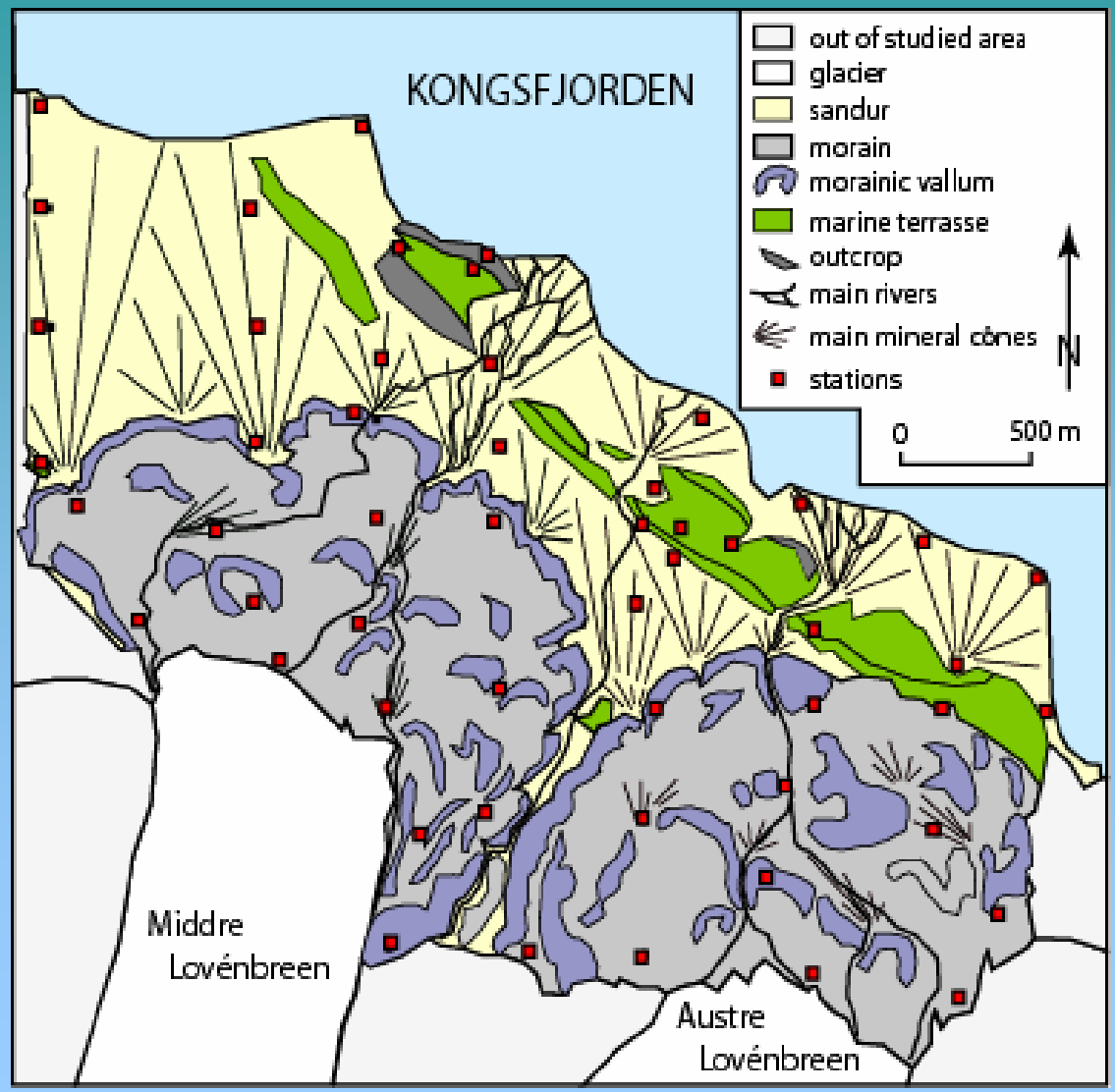
Fjord

sandur

plain

morainic amphitheater

Mountain with two glaciers



# Data set 1
# 53 temperature loggers

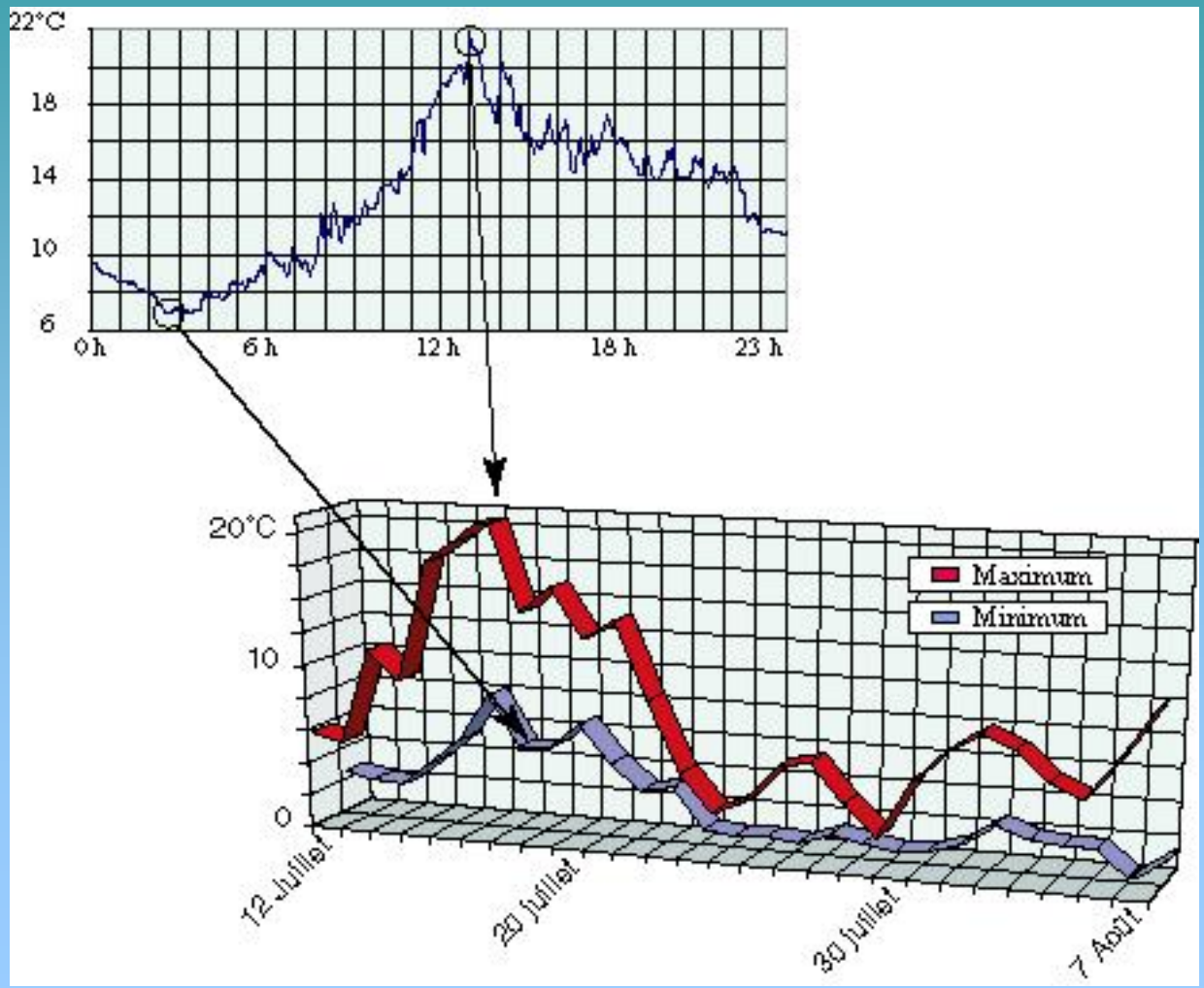
- Type: HOBO

- Located at 20 cm above the ground

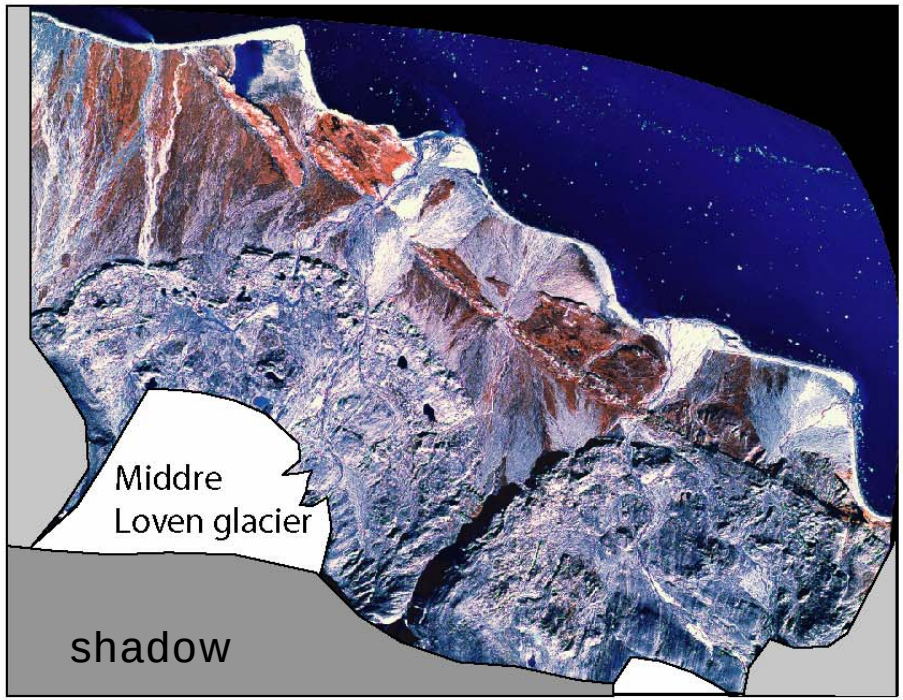
# Temperature records

- Record once every 6 minutes from 12th of July until 7 of August 1999 (27 days)

- Daily minima are extracted from the records

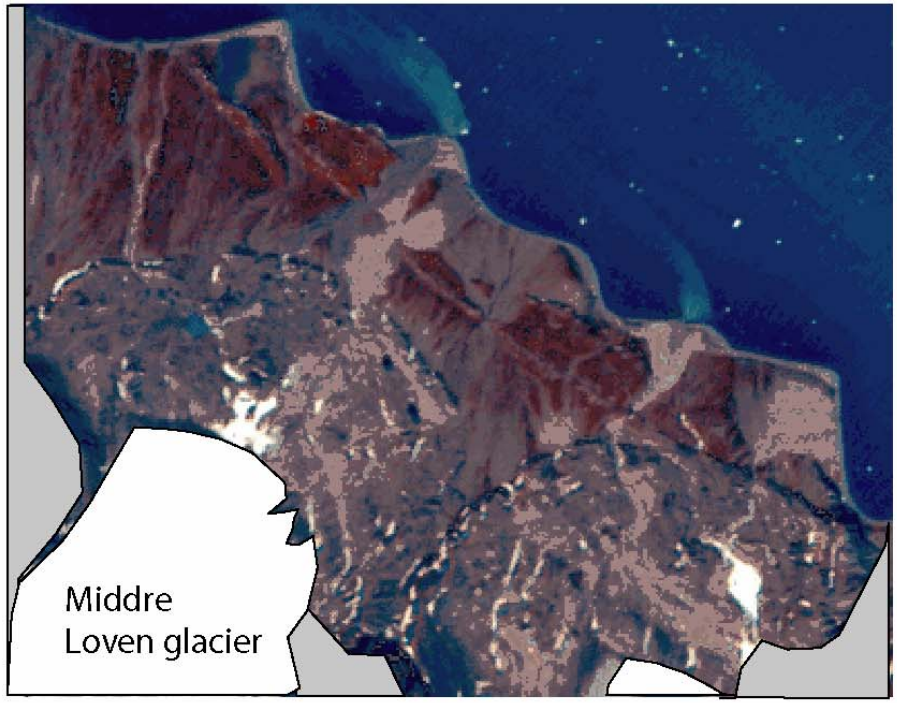


# Data set 2
# Remote sensed images




2 m primary data

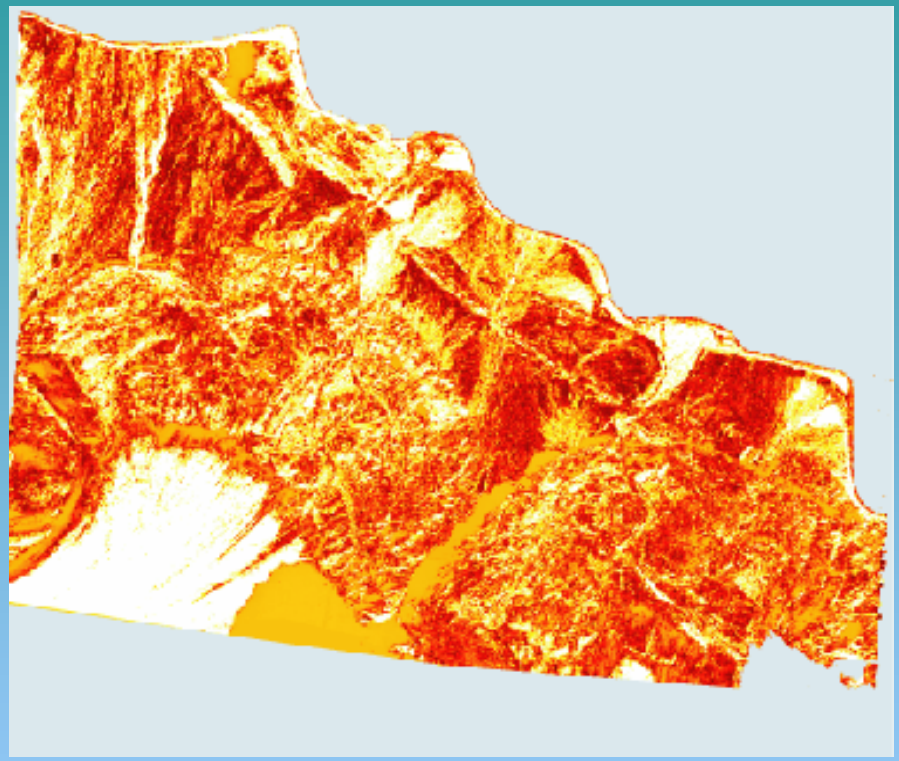
a scanned infrared
aerial photography




20 m primary data

SPOT image

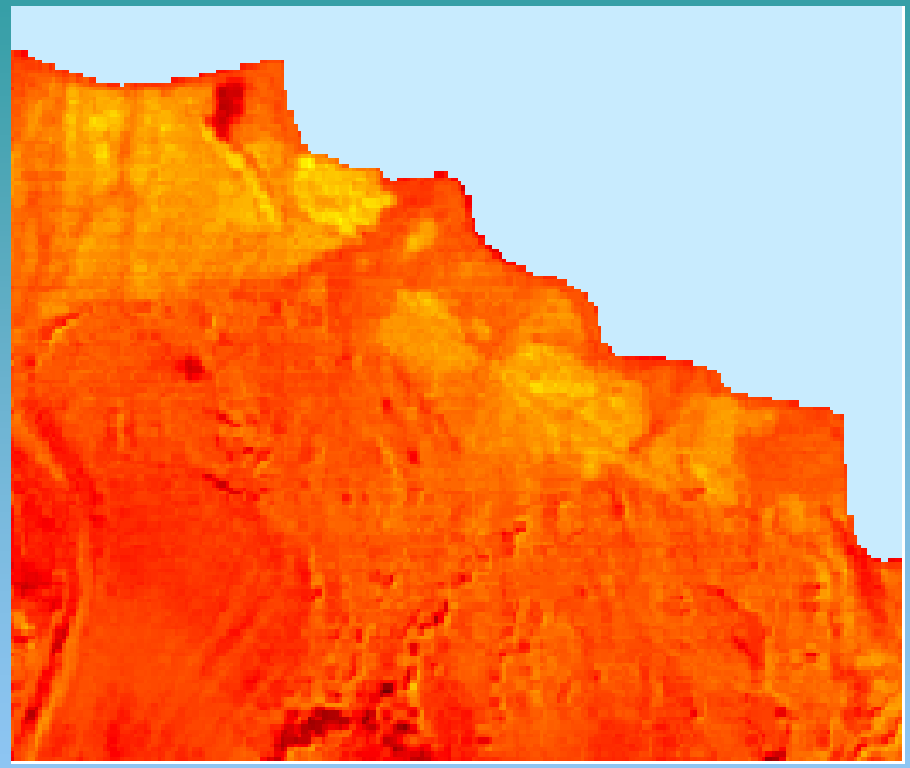
# Derived data from remote sensed data



2 m primary data

PVI

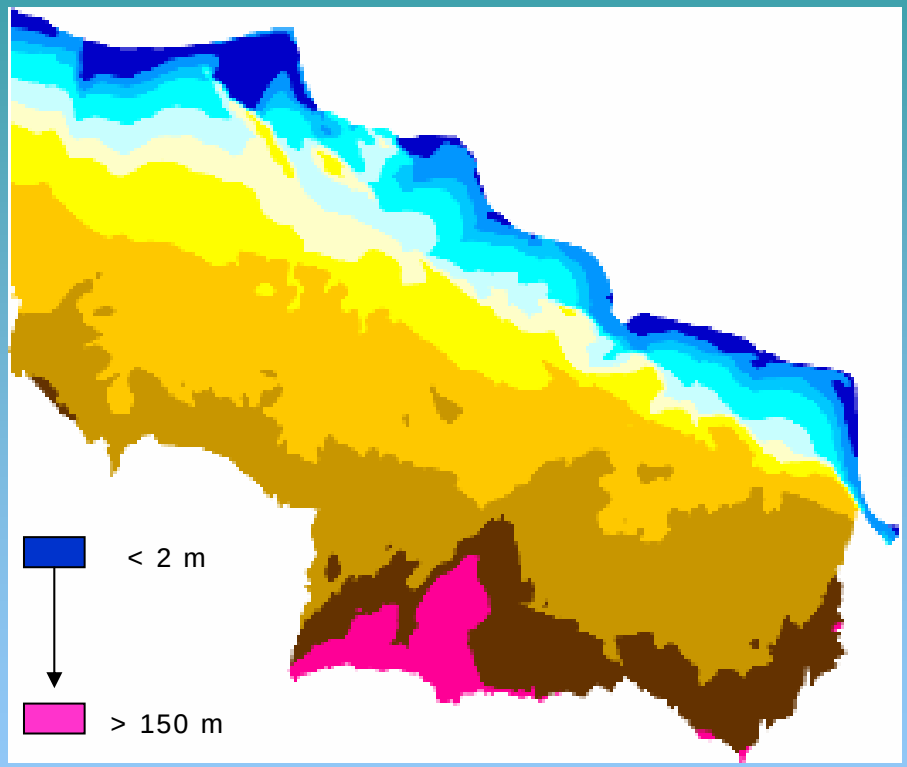
(**P**robability to belong
a 100% **V**egetated area **I**ndex)



20 m primary data

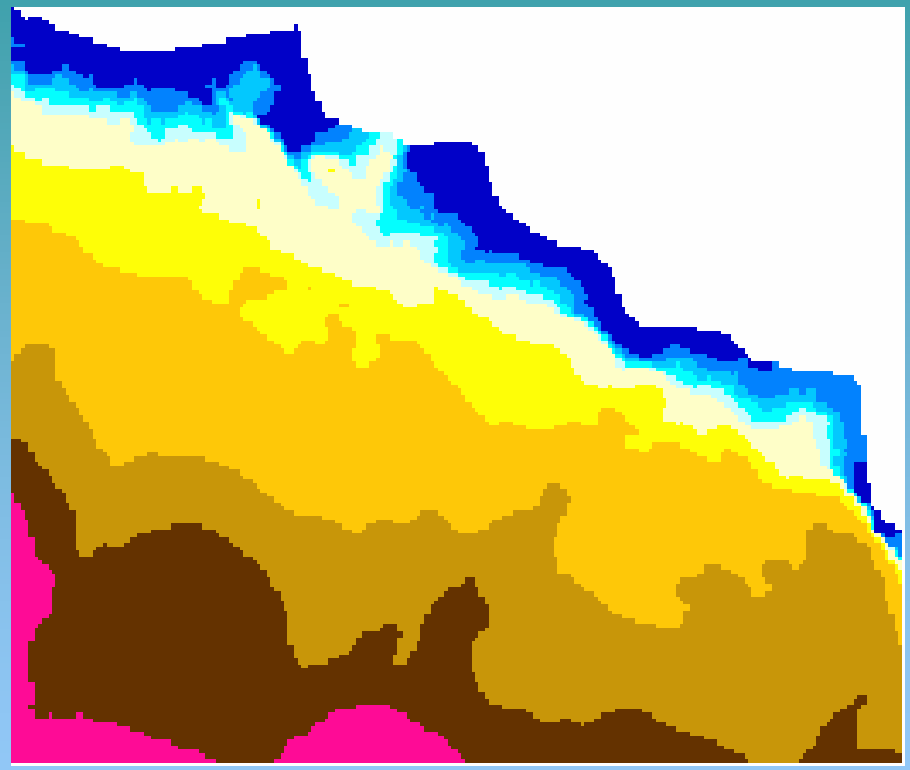
NDVI

# Data set 3
# Didital elevation model




2 m

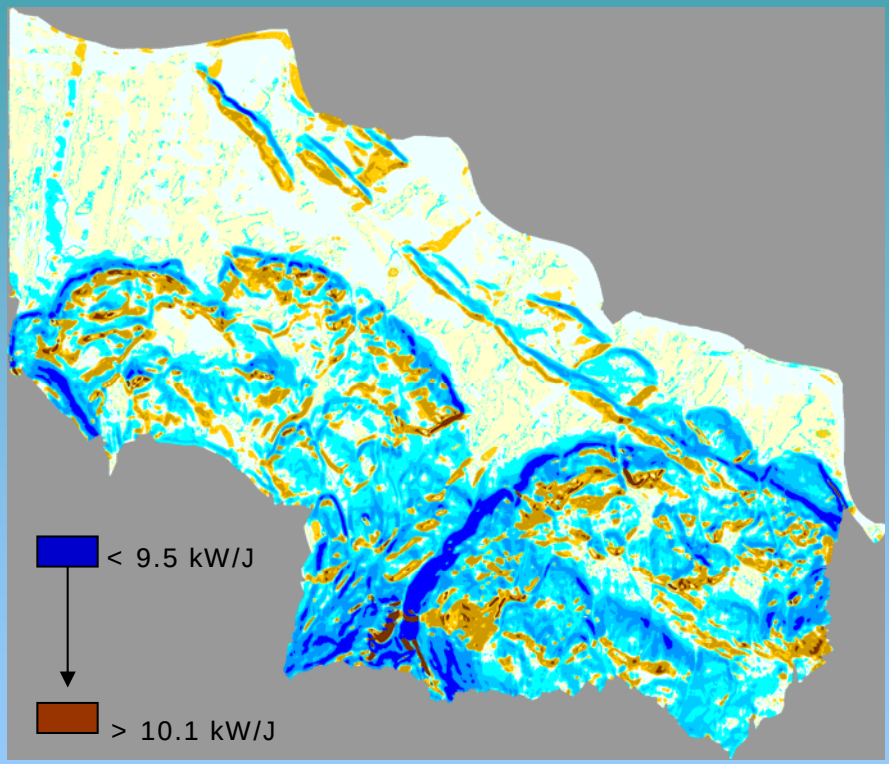
a GPS DEM



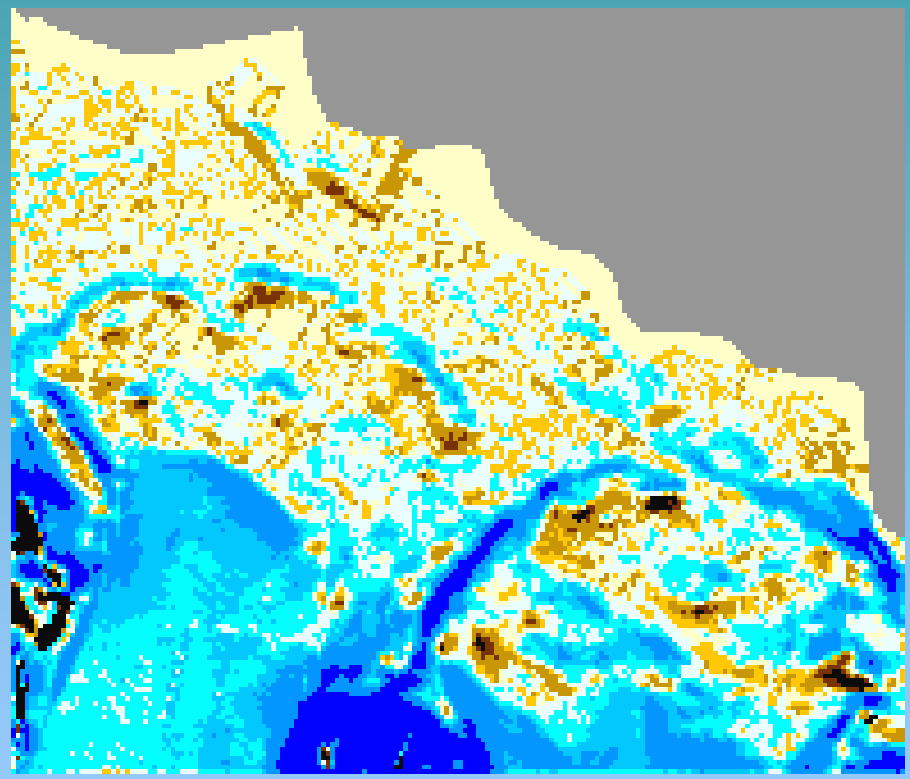
20 m

Norsk PolarInstitut DEM

# Derived data from DEM: Solar energy




2 m primary data



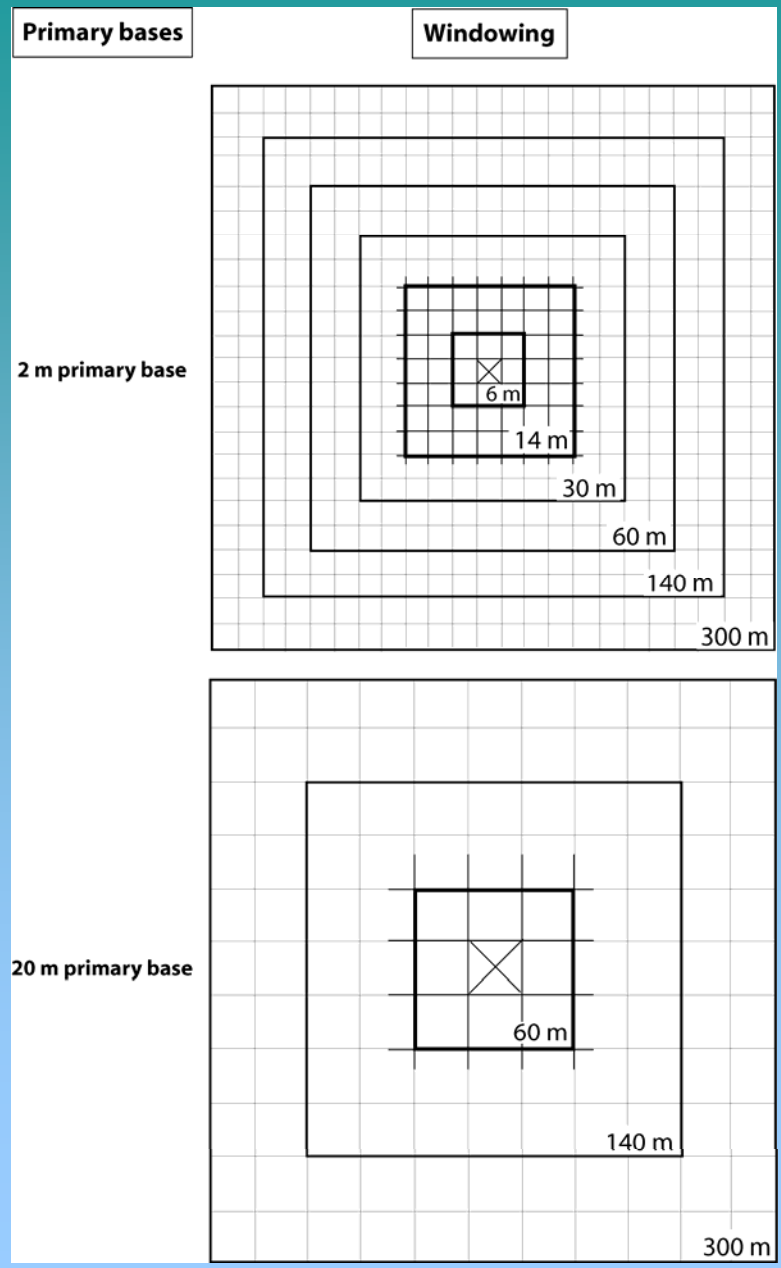
20 m primary data

# 3. Method

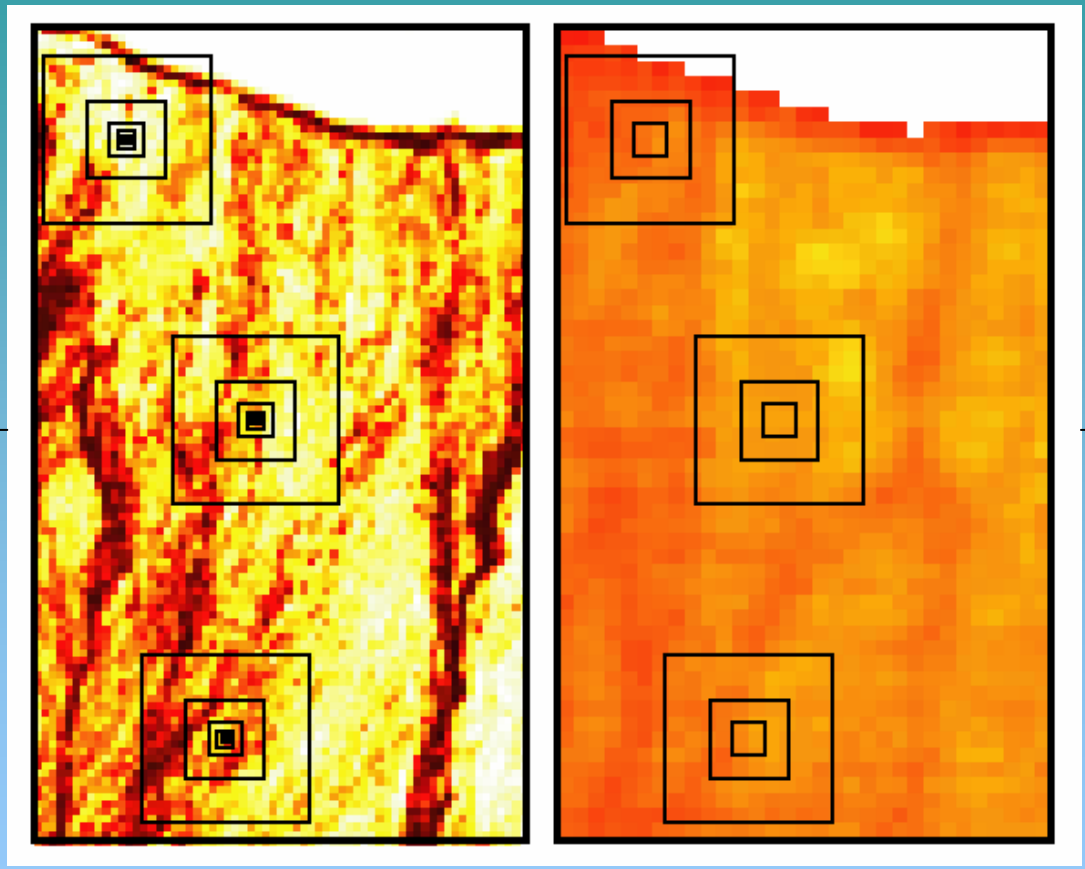
## Procedure of windowing

From the 2 m primary database,
6 subsests
(6 m square to 300 m square windows)
are derived

From the 20 m primary database,
3 subsests
(60 m square to 300 m square windows)
are derived



# Windowing is applied on the derived files



2 m primary data

20 m primary data

6 VPI values are provided
(one for each window)

3 NDVI values are provided
(one for each window)

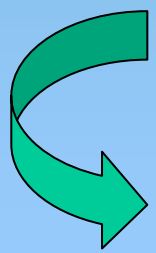
# Linear correlation analysis

**Variable to be explained**:

- daily minima of temperature
  (17th of July and 5th of August)

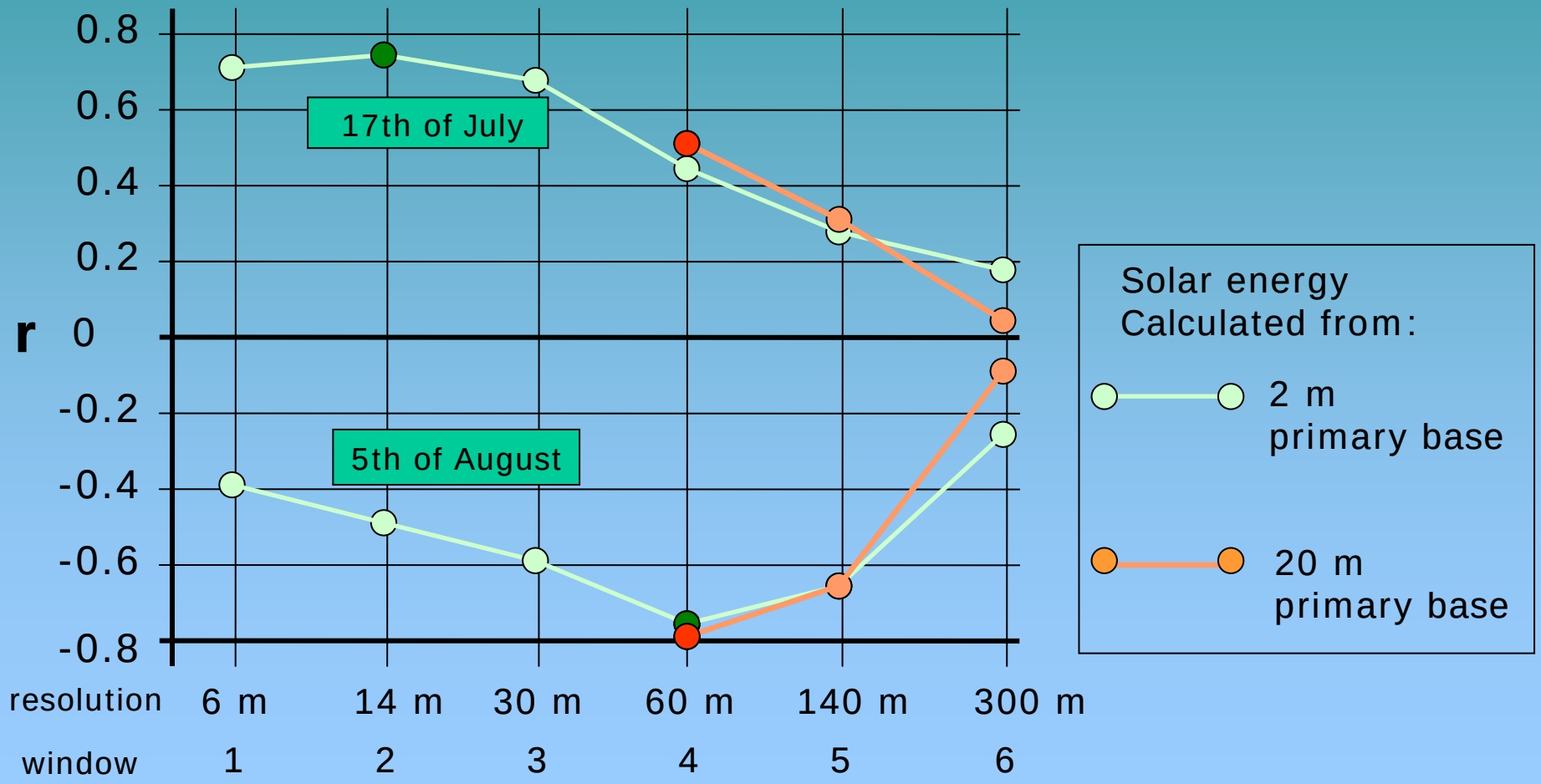
**Explanatory variables**:

- solar energy
- PVI and NDVI
- elevation



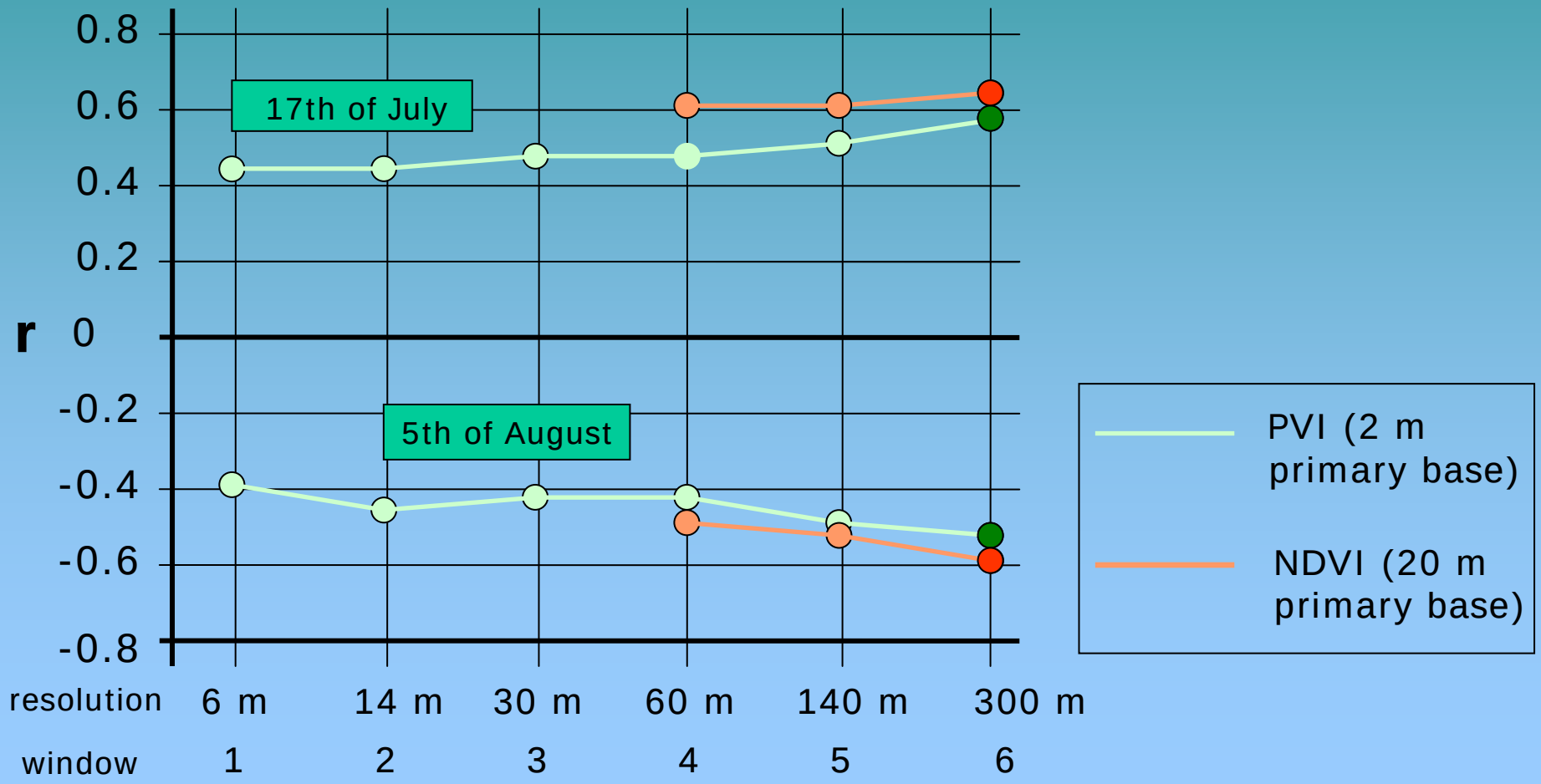
One coefficient of correlation for each date, each explanatory variable, each window

# 4. Results
# linear correlation analysis
## applied to Solar energy



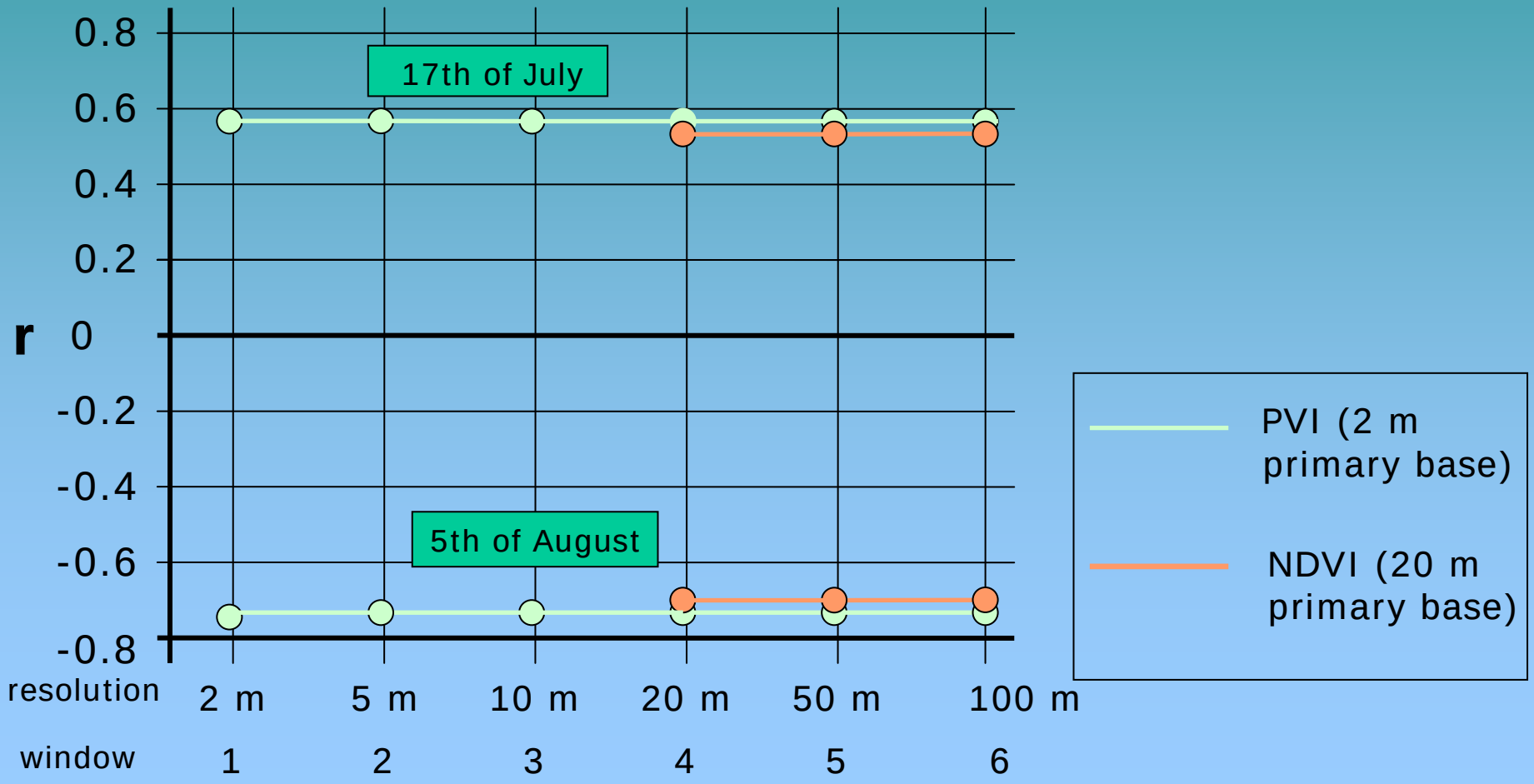
# linear correlation analysis

## applied to vegetation indices



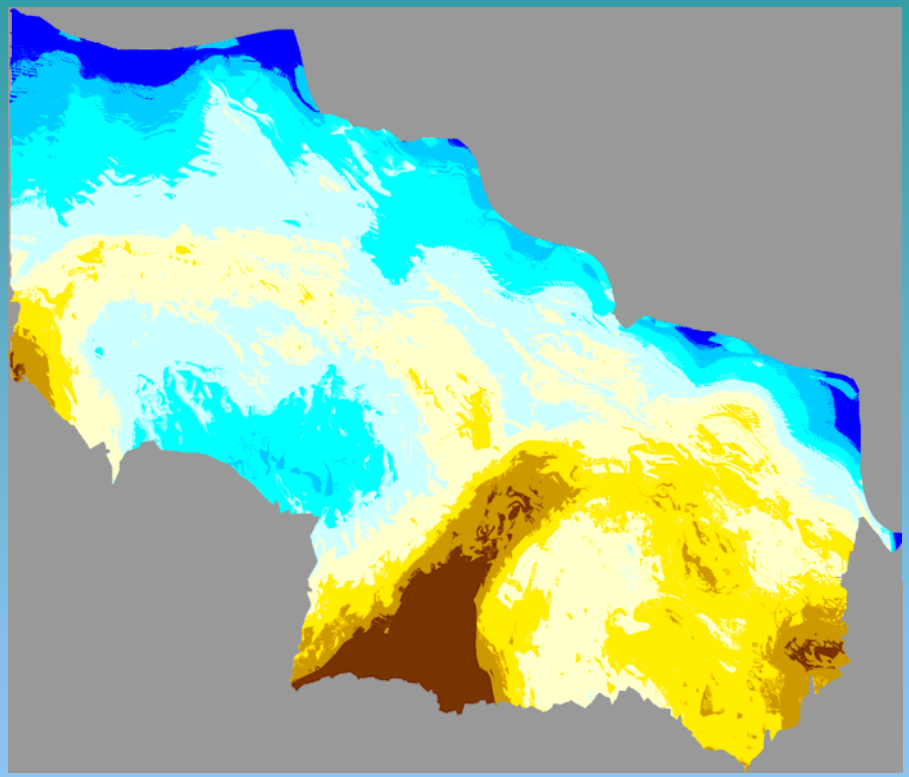
# linear correlation analysis

## applied to altitude



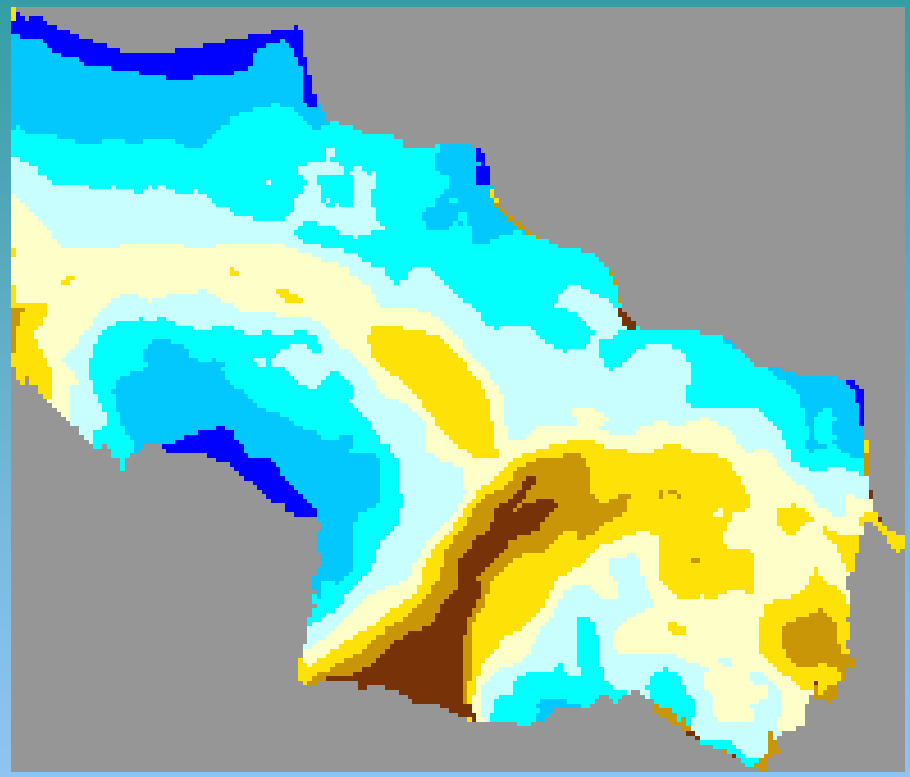
# Temperature map

## 17th of July



2 m resolution

Temp=f(g1, se2, e1, PVI6, PrxFj)



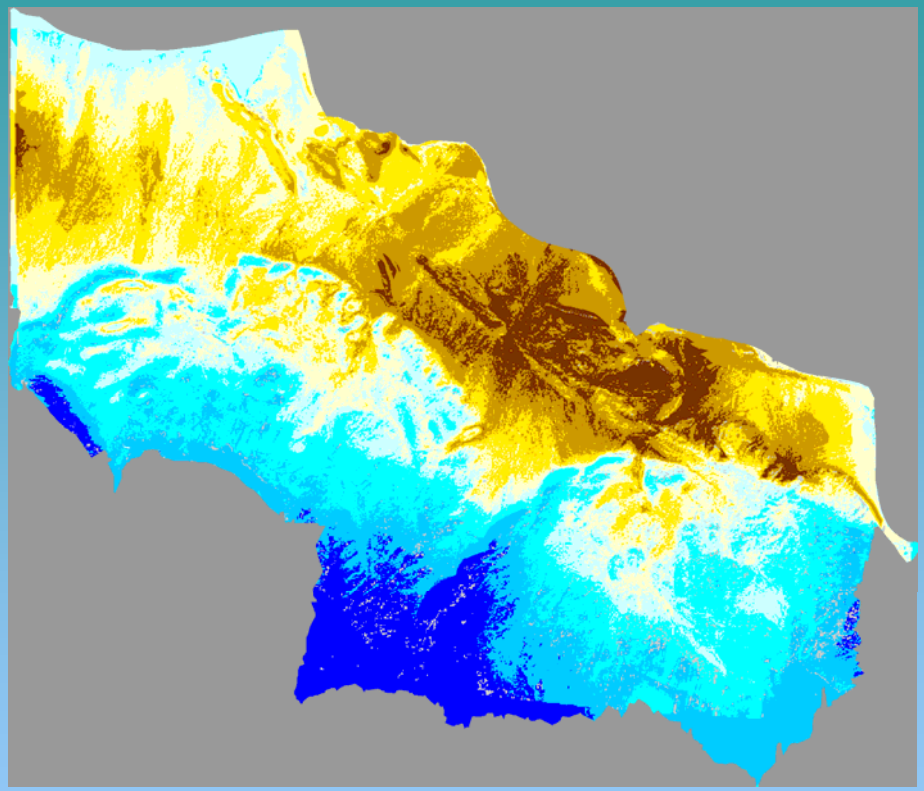
20 m resolution

Temp=f(g4, se4, e4, PVI6, PrxFj)

g=gradient, se=solar energy, e=elevation,
Pvi=probability to belonging a 100% vegetated area Index
PrxFj=proximity to the fjord

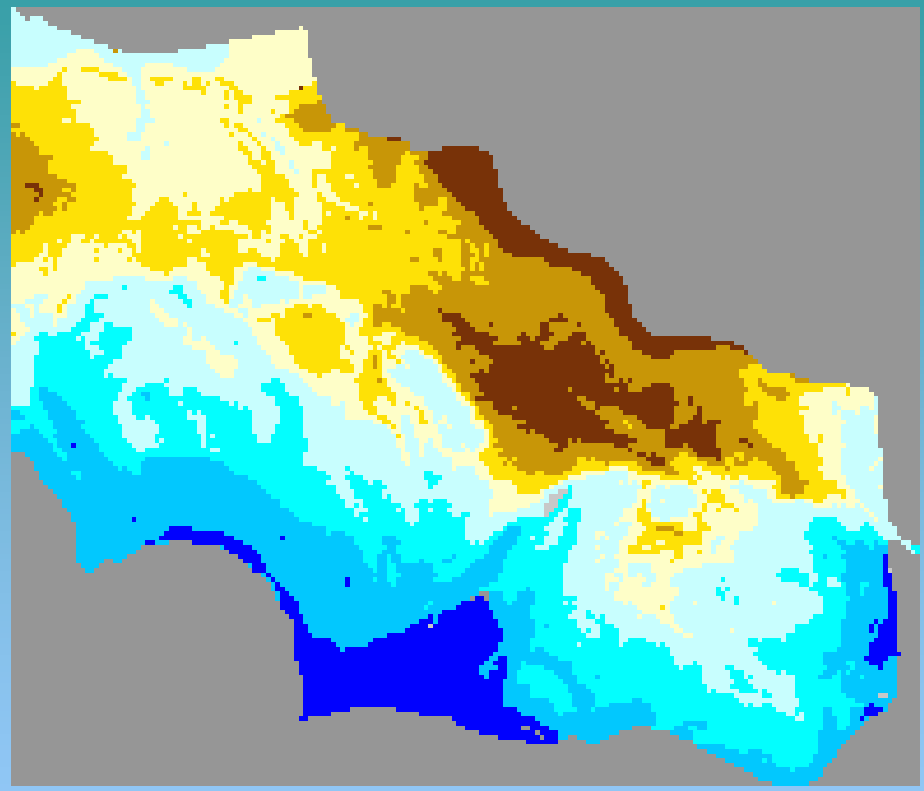
# Temperature map

## 5th of August



2 m resolution

Temp=f(se4, e1, g3, NDVI6)



20 m resolution

Temp=f(se4, e4, g4, NDVI6)

g=gradient, se=solar energy, e=elevation

# Conclusions

The highest coefficient on each curve marks the optimum scale level; it varies in value and place according to the variables.

The results from the both primary DTM are similar.

NDVI (satellite image) provides better results than PVI (Infrared aerial photography).

Temperature distribution modelling is optimum when using usual data sources such as satellite images and DTM available for wide areas.